A new *Copaxa* from Ecuador and its immature stages (Lepidoptera: Saturniidae, Saturniinae)

Kirby L. Wolfe[1] and Christopher A. Conlan[2]

Kirby L. Wolfe, 3090 Cordrey Drive, Escondido, California 92029, U.S.A., email: kirwolfe@pacbell.net

Christopher A. Conlan, 11513 Hadar Drive, San Diego, California 92126, USA, email: conlan@adnc.com

Abstract: *Copaxa **litensis*** n. sp. is described from northwest Ecuador. It is related to the *Copaxa multifenestrata* group and is mainly recognizable by its small size and by the more falcate apex of the forewings. This species closely resembles *Copaxa multifenestrata* in appearance and *Copaxa satellita* in genitalia. Males are essentially diurnal, mating at midday. Male and female genitalia are figured and immature stages are described and illustrated in color. Larvae fed in the laboratory on *Persea americana* (Lauraceae).

Key words: *Copaxa litensis*, distribution, immature stages, larvae, Neotropical, Saturniidae.

Una *Copaxa* nueva del Ecuador y sus estadios inmaduros (Lepidoptera: Saturniidae, Saturniinae)

Resumen: Se describe *Copaxa **litensis*** **n. sp.** del noroeste del Ecuador. Pertenece al grupo de *Copaxa multifenestrata* y se reconoce mayormente por su tamaño pequeño y el ápice más falcado en las alas delanteras. Esta especie se parece mucho a *Copaxa multifenestrata* externalmente y a *Copaxa satellita* por sus genitales. Los machos son esencialmente diurnos, acoplando por mediodía. Se figuran los genitales de macho y hembra y se describe e ilustra en colores los estadios inmaduros. En el laboratorio las larvas se alimentaron de *Persea americana* (Lauraceae).

Eine neue *Copaxa* von Ecuador und ihre Präimaginalstadien (Lepidoptera: Saturniidae, Saturniinae)

Zusammenfassung: Die neue Art *Copaxa **litensis*** **n. sp.** aus dem Nordosten von Ecuador wird beschrieben. Sie gehört zur Gruppe von *Copaxa multifenestrata* und unterscheidet sich habituell in erster Linie durch die geringere Größe und den stärker falkaten Vorderflügelapex. Im Habitus erinnert die neue Art am ehesten an *Copaxa multifenestrata,* die Genitalmorphologie kommt näher zu *Copaxa satellita*. Die Männchen sind in erster Linie tagaktiv, die Paarung findet um den Mittag herum statt. Männliche und weibliche Genitalien werden abgebildet sowie in Farbe beide Geschlechter und die Präimaginalstadien. In der Zucht fraßen die Raupen an *Persea americana* (Lauraceae).

The Genus *Copaxa* Walker, 1855 is presently represented by about 35 species (Lemaire 1996) of mostly medium to large broad-winged moths often presenting dead leaf patterns in brown or tan but in some species displaying bright yellow, pink, green, orange, reddish or black. Most members of the genus fit easily into a model of one of four groups each of whose species share obvious characteristics. The present species belongs to the *C. multifenestrata* (Herrich-Schäffer, [1858]) group, with multiple "windows" or translucent discal spots on the forewings.

This new species was not initially recognized as such. Two females, which did not obviously differ from typical *C. multifenestrata* except by smaller size, were captured by the authors and their wives in Ecuador, Carchi Province, on the road from Salinas to San Lorenzo, 7.4 km west of Lita, elevation 800 m, on April 30, 2000, and oviposited in paper bags. Reared by Conlan in the laboratory, larvae presented color and characteristics dramatically different from typical *multifenestrata* larvae (Wolfe 1993: fig. 118) previously reared from a nearby population on the Pacific slope of central Ecuador by Wolfe, instead resembling larvae of a southwest Mexican population of *multifenestrata* (Wolfe 1993: fig. 117) (*Copaxa satellita* larvae do not obviously differ from larvae of typical *Copaxa multifenestrata:* Wolfe, unpubl. notes). Furthermore, the emerged adult males proved to be distinctive in size and shape, and diurnal in habit, unlike the nearby population of *multifenestrata*, whose males are nocturnal (Wolfe 1993: 25). Subsequent dissection of the genitalia further indicated it to be a distinct species. A subsequent F2 generation was reared by both Conlan and Wolfe, and detailed notes on their development were kept. Photographs and genitalia drawings were made by Wolfe. The original wild-collected female specimens were inadvertently completely destroyed during oviposition and were discarded.

*Copaxa **litensis*** n. sp.

Holotype ♂: *ab ovo*, Ecuador, Carchi Prov., Rd. Salinas to San Lorenzo, 7.4 km W. Lita, el. 800 m, 30 Apr. 2000, GPS = 00°52.39N, 78°29.53W, K. & S. Wolfe, C. & M. Conlan.

Paratypes: Allotype ♀: same data, *ab ovo*. 14 ♂♂, 12 ♀♀: same data, *ab ovo.*

The holotype ♂ and allotype ♀ will be deposited in the Natural History Museum of Los Angeles County; paratypes will be placed in the National Museum of Natural History in Washington, U.S.A., the Muséum national d'Histoire naturelle, Paris, France, the Natural History Museum, London, U.K., the Departamento de Biología of the Pontificia Universidad Católica, Ecuador, the Senckenberg-Museum, Frankfurt am Main, the collection of Stefan Naumann, Berlin, Germany, and in the collections of the authors.

Etymology: This species is named after the village of Lita, near which the specimens were collected.

Diagnosis: This new species belongs to the *Copaxa multifenestrata* group, with the genitalia somewhat resembling those of *Copaxa satellita* Walker, 1865 (Lemaire, pers. comm.) both species from which it can be distinguished by its smaller size. Color also resembles that of *C. satellita* in that ♂♂ are dimorphically either yellow (with forewings anteriorly and distally black), or entirely dark reddish brown or plain brown with more or less black in

[1, 2] Research Associate, Natural History Museum of Los Angeles County, California.

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discal and distal area of forewing, but brown *C. litensis* ♂♂ are usually darker and more reddish than the brown form of *satellita.* Tips of forewings are also much more falcate than in *multifenestrata* or *satellita*.

Description: Wingspan: ♂♂ 60–75 mm, ♀♀ 71–88 mm. It is probable that the smaller measurements represent undersized specimens due to rearing conditions.

♂ (Figs. 1, 2): Head: Yellow with grayish tan palpi (yellow morph) or purplish gray with palpi same (brown morph); antennae with yellow flagellum and dark reddish brown rami. Thorax: Yellow (yellow morph) or dark brown (brown morph) with purplish gray collar. Abdomen: Yellow or dark brown. Forewing: Length 30–38 mm; broad with produced falcate tips; ground color dorsally either bright yellow or brown, usually dark reddish brown, more or less densely scaled sepia black on distal third and on outer edge of wavy postmedial line; usually 1–3 unequal, rounded translucent discal spots; ventrally yellow or dark brown. Hindwing: dorsally yellow or dark brown as in forewing, antemedial line straight or slightly convex, postmedial wavy with wavy narrow submarginal band; ventrally yellow or brown.

♀ (Fig. 3): Head: Gray brown, palpi same; antennae yellow. Thorax: brown. Abdomen: Gray brown. Forewing: Length 37–45 mm; wings slightly broader, more rounded than in ♂; fore- and hindwings ground color brown, slighty reddish with black ante- and postmedial lines and a dark gray band on outer edge of postmedian lightly dusted with white scales; rounded translucent discal spots larger and more numerous than in ♂; underside dark gray brown heavily dusted with grayish white scales on median area of wings.

♂ **genitalia** (Fig. 11): Structures similar to those of *C. multifenestrata* (see Lemaire 1978); arms of incomplete gnathos short and pointed; slightly sclerotized uncus bifid, downcurved, much longer than in *C. multifenestrata*; triangular hook-like lobes of transtilla heavily sclerotized and minutely thorny on posterior edge; juxta with pair of unequal sclerotized spines posteriorly; aedeagus similar to *C. multifenestrata*.

♀ **genitalia** (Fig. 12): Antevaginal plate large, covering ostium bursae; postvaginal plate also large, anteriorly oval, all lightly sclerotized.

Immature stages: Wild captured females were placed in paper bags and allowed to oviposit. Oviposition occurred on 12–14 July, 2000. Eggs were maintained in a plastic-covered petri dish in the laboratory at 25–27°C with a small piece of wet paper towel to provide moisture. Lid was misted with distilled water nightly as time of hatching neared. Eggs hatched in about 12 days and larvae fed on Avocado (*Persea americana* Miller, Lauraceae). Most larvae were reared in plastic boxes with screened lids on cut branches based in water with food changed every 48 hours. A few were sleeved on potted avocado trees. Head capsules were collected to identify instar number, each instar was measured at full size, photographed in color and preserved in alcohol. Larvae completed five instars, molting during early morning light after one night of premolt inactivity, and required less than three weeks from hatching to cocoon. Larvae in all stages displayed separated, unfused dorsal scoli on A8 segment typical for *Copaxa* (Wolfe 1993: Fig. 2 and text p. 4). First adult moths began to emerge on 20 September, after ca. five weeks in the cocoon, and last moth emerged on September 29.

Egg (Fig. 4): 1.8 mm long × 1.3 mm wide × 1.1 mm deep, flat ovoid, brown with transparent top and bottom faces, usually deposited in curved strings stacked four or more high with all micropiles directionally oriented alike.

Larva:

First Instar (Fig. 5): Larvae mostly eclosed shortly after dawn on 25 July. Number of eggs and percentage of eclosion not noted. Head: 0.8 mm wide, shiny black, primary setae white. Body: 8.8 mm max. length; color cream with five interrupted and somewhat indistinct black stripes on each side; scoli mauve, spines pale translucent; thoracic legs dark gray, abdominal prolegs and paranal lobes translucent white.

Second Instar (Fig. 6): Molt to second instar on 30 July. Head: 1 mm wide, shiny black, primary setae white. Body: 17.6 mm max. length; color similar to first instar but with black stripes more distinct, dorsal surface heavily washed pink; angular black spots on paranal lobes

Third Instar (Fig. 7): Molt to third instar on 3 August. Head: 2 mm wide, color and setae as in 2nd instar. Body: 23 mm max. length; color similar to second instar, but with pink and white "checkered" pattern more pronounced, black lines more distinct, especially broad middorsal line consisting of barely connected bottle-shaped black marks on each segment, bordered white; legs and paranal lobes as in 2nd instar.

Fourth Instar (Fig. 8): Molt to fourth instar on 6 August. Head: 3 mm, reddish brown with greenish white frons. Body: 32 mm max. length; black with indistinct green speckling on dorsum, light green ventrally with midventral greenish white stripe; subspiracular stripe indistinct, alternating green and red; thoracic legs dark brown, abdominal prolegs and paranal lobes pink; scoli cylindrical, bright red, some with pink spines, most with white spines; spiracles orange; overall, most setae long, white, but many setae, especially on paranal lobes, red.

Fifth Instar (Fig. 9): Molt to fifth instar on 10 August. Head: 4 mm, color and setae as in 4th instar. Body: 67 mm long, 10 mm thick; color and spination very similar to 4th instar, but with less green speckling dorsally, and abdominal prolegs more green than pink. Many larvae spun cocoons on 14 August.

Pupa: First pupae noted on 19 August. 22–27 mm long, 9–11 mm thick, medium brown, cremaster smooth without bristles or hooks.

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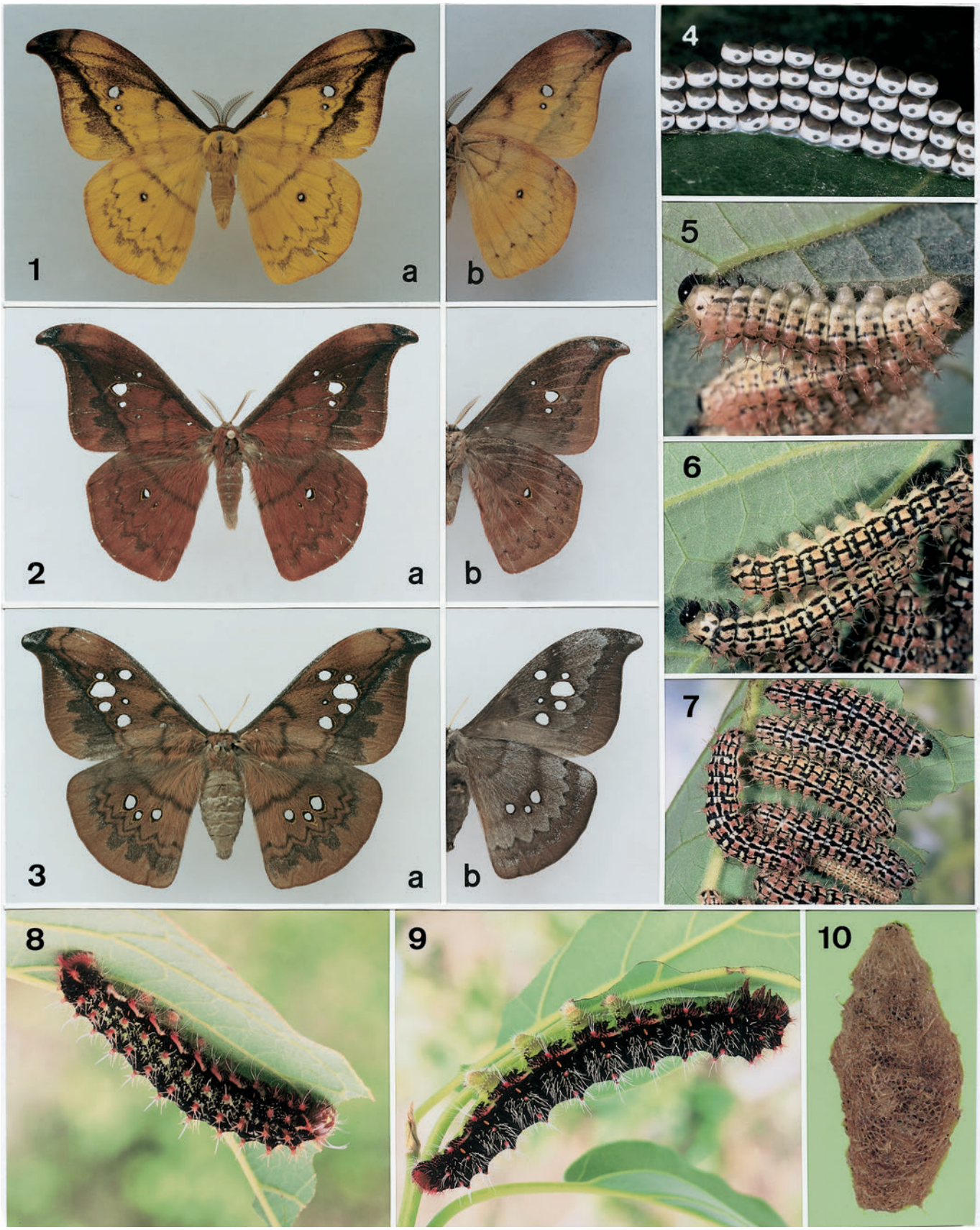

Colour plate, Figs. 1–10: *Copaxa litensis* n. sp. **Fig. 1:** Holotype ♂. **Fig. 2:** Paratype ♂. **Fig. 3:** Allotype ♀. **Fig. 4:** Eggs. **Fig. 5:** First instar larva. **Fig. 6:** Second instar larva. **Fig. 7:** Third instar larva. **Fig. 8:** Fourth instar larva. **Fig. 9:** Fifth instar larva. **Fig. 10:** Cocoon.

Cocoon (Fig. 10): Reddish brown, very open mesh; pupa easily visible inside. In the laboratory, cocoon was spun either uncovered on branch or slightly hidden in a folded leaf or debris.

Hosts: Wild: Unknown. **Laboratory:** Larvae fed on *Persea americana* Miller in the laboratory.

Distribution and flight period: Known only from type locality, mountainous rain forest at low elevation on the

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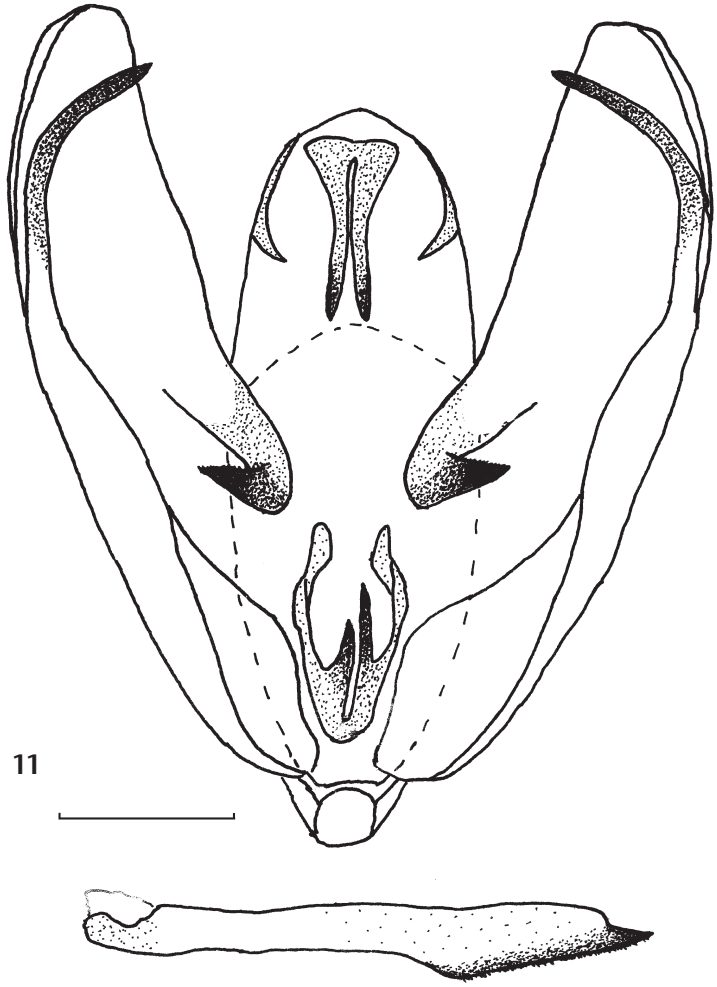

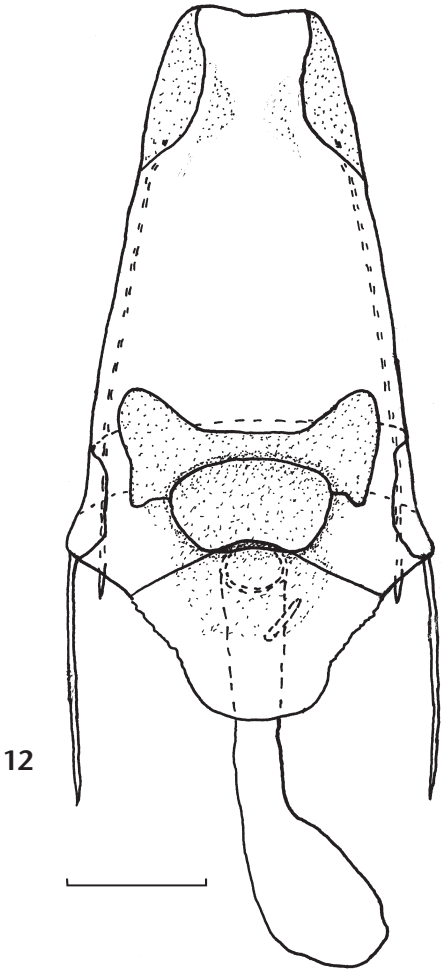

Fig. 11: Male genitalia. **Fig. 12:** Female genitalia. — Scalebars 1 mm.

Pacific slope of northern Ecuador. *Copaxa litensis* is multibrooded and probably on the wing throughout much of the year. Reared ♂♂ searched for mates at midday. Adults emerged from the cocoon between 02.00–02.30 h PDT (Pacific Standard Time), and the males flew briefly before dawn to disperse. Females were seen beginning to emit pheromone at 12.15 h and one male mated at 12.20 h. Pair remained coupled until 19.05 h, at twilight just before dark, when the male uncoupled and briefly flew.

Observations: Larval development was markedly more rapid than in any of hundreds of Saturniidae species reared by the authors. Most species require at least 5–8 days or more per instar (unpublished notes). A behavior unusual for *Copaxa* larvae was noted at the end of the fifth instar, in which larvae when disturbed dropped to the ground thrashing from side to side.

Remarks: It is probable that this species has not previously come to the attention of collectors because the diurnal males probably do not often come to lights, and the females do not obviously differ from small females of *Copaxa multifenestrata*.

A number of *Copaxa* species have diurnal males. Known examples include Mexican and some Central American populations of *C. multifenestra* (Wolfe 1993), *C. cineracea* W. Rothschild, 1895, *C. joinvillea* Schaus, 1921, and several species of the *C. semioculata* (R. Felder & Rogenhofer, 1874) complex (Wolfe, unpubl. notes). The *Copaxa sapatoza* (Westwood, [1854]) male is crepuscular (Wolfe, unpubl. notes).

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